

Claims

- [c1] 1.A method for operating a variable compression ratio internal combustion engine, comprising:
determining a compression ratio operating state of the engine; and
inferring a torque output for the engine based at least in part on the compression ratio operating state of the engine.
- [c2] 2.The method according to claim 1, further comprising:
determining an operating speed of the engine;
determining an air flow of the engine; and
wherein said step of inferring the engine torque output comprises the step of determining at least one predefined indicated torque value based on the engine speed, the air flow and the compression ratio operating state of the engine.
- [c3] 3. The method according to claim 2, further comprising the step of modifying the indicated torque value based on operating conditions of the engine.
- [c4] 4.The method according to claim 1, further comprising:
determining an operating speed of the engine;
determining an air flow of the engine; and
wherein said step of inferring the engine torque output comprises the step of determining at least one predefined engine friction loss value based on the engine speed, the air flow and the compression ratio operating state of the engine.
- [c5] 5. The method according to claim 4, further comprising the step of modifying the engine friction loss value based on secondary frictional losses of the engine.
- [c6] 6.A method for estimating an indicated torque value for an internal combustion engine having a plurality of compression ratio operating states, comprising:
determining a current compression ratio operating state of the engine;
determining an operating speed of the engine;
determining an air flow of the engine;
determining a determining a baseline indicated torque value based on the engine speed, the air flow and compression ratio operating state of the engine;

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and

modifying the indicated torque value based on operating conditions of the engine.

[c7] 7. The method according to claim 6, wherein said step of determining the baseline indicated torque value comprises selecting at least one predefined baseline indicated torque value.

[c8] 8. The method according to claim 6, wherein said step of determining the baseline indicated torque value comprises selecting a predefined baseline indicated torque value corresponding to the compression ratio operating state of the engine.

[c9] 9. The method according to claim 6, wherein said step of determining the baseline indicated torque value comprises:
selecting a predefined maximum baseline indicated torque value corresponding to a maximum compression ratio operating state of the engine;
selecting a predefined minimum baseline indicated torque value corresponding to a minimum compression ratio operating state of the engine; and
using said predefined maximum and minimum baseline indicated torque values to derive the baseline indicated torque value corresponding to the compression ratio operating state of the engine.

[c10] 10. A method for estimating an engine friction loss for an internal combustion engine having a plurality of compression ratio operating states, comprising:
determining a current compression ratio operating state of the engine;
determining an operating speed of the engine;
determining an air flow of the engine;
determining a baseline engine friction loss value based on the engine speed, the air flow and compression ratio operating state of the engine; and
modifying the baseline engine friction loss value based on operating conditions of the engine.

[c11] 11. The method according to claim 10, wherein said step of determining the baseline engine friction loss value comprises selecting at least one predefined

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baseline indicated torque value.

[c12] 12.The method according to claim 10, wherein said step of determining the baseline engine friction loss value comprises selecting a predefined baseline engine friction loss value corresponding to the compression ratio operating state of the engine.

[c13] 13.The method according to claim 10, wherein said step of determining the baseline engine friction loss value comprises:
selecting a predefined maximum baseline engine friction loss value corresponding to a maximum compression ratio operating state of the engine;
selecting a predefined minimum baseline engine friction loss value corresponding to a minimum compression ratio operating state of the engine;
and
using said predefined maximum and minimum baseline engine friction loss values to derive the baseline engine friction loss value corresponding to the compression ratio operating state of the engine.

[c14] 14.A method for inferring brake engine torque of an internal combustion engine having a plurality of compression ratio operating states, comprising:
determining a current compression ratio operating state of the engine;
determining an operating speed of the engine;
determining an air flow of the engine;
determining a baseline indicated torque value based on the engine speed, the air flow and compression ratio operating state of the engine;
determining a baseline engine friction loss value based on the engine speed, the air flow and compression ratio operating state of the engine; and
using the baseline indicated torque and baseline engine friction loss values to derive an estimate for the brake engine torque.

[c15] 15.The method according to claim 14, comprising:
modifying one or both of the baseline indicated torque and the baseline engine friction loss value based on operating conditions of the engine;
using one or both of the modified baseline indicated torque and the baseline engine friction loss values to derive an estimate for the brake engine torque

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